CLAIMS

What is claimed is:

1. A pultrusion method of producing a composite structural sandwich member having a rigid structural element embedded therein, the method comprising the steps of:

providing at least one structural element comprising a rigid, pre-rigidized, or rigidizable element;

aligning a plurality of core elements in a process direction with the structural element disposed between opposed faces of at least two adjacent core elements;

feeding upper and lower fiber face skins onto outwardly facing surfaces of the aligned plurality of core elements to form a sandwich arrangement; and

pulling the sandwich arrangement through a pultrusion process comprising:

wetting out the sandwich arrangement with resin, and

introducing the sandwich arrangement into a heated pultrusion die to cure the resin.

2. The pultrusion method of claim 1, wherein in the step of providing the structural element, the structural element is formed from a fabric, and in the wetting out step, resin is further impregnated into the structural element.

3. The pultrusion method of claim 1, wherein in the step of providing the structural element, the structural element comprises a pre-pultruded element.

4. The pultrusion method of claim 1, wherein in the step of providing the structural element, the structural element comprises a pre-impregnated fiber-reinforced element.

5. The pultrusion method of claim 1, wherein in the step of providing the structural element, the structural element is channel-shaped, I-shaped, H-shaped, T-shaped, Z-shaped, C-shaped, or box-shaped in cross-section.

6. The pultrusion method of claim 1, wherein in the step of providing the structural element, the structural element is hollow in cross-section.

7. The pultrusion method of claim 1, wherein the structural element comprises a fabric material, and in the aligning step, the fabric material is wrapped over a portion of at least one core element.

8. The pultrusion method of claim 1, wherein the structural element is disposed between the adjacent core elements in a plane perpendicular to the direction of travel in the pultrusion process.

9. The pultrusion method of claim 1, wherein the structural element is disposed horizontally between the adjacent core elements in a plane parallel to the direction of travel in the pultrusion process.

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10. The pultrusion method of claim 1, wherein the structural element is disposed vertically between the adjacent core elements in a plane parallel to the direction of travel in the pultrusion process.

11. The pultrusion method of claim 1, wherein the structural element is disposed in a predetermined location to provide a hard point within the sandwich arrangement.

12. The pultrusion method of claim 1, wherein the structural element is disposed between opposed faces of a plurality of adjacent core elements.

13. The pultrusion method of claim 1, further comprising disposing a plurality of structural elements between opposed faces of a corresponding plurality of two adjacent core elements;

14. The pultrusion method of claim 1, wherein the pultrusion process further comprises heating the sandwich arrangement downstream of the pultrusion die to further cure the resin.

15. The pultrusion method of claim 1, wherein in the wetting out step, resin is impregnated into the upper and lower fiber face skins.

16. The pultrusion method of claim 1, wherein in the aligning step, the core elements comprise a homogeneous material.

17. The pultrusion method of claim 1, wherein in the aligning step, the core elements are formed from a foam material or a balsa material.

18. The pultrusion method of claim 1, wherein in the aligning step, the core elements are formed of a closed cell or honeycomb material.

19. A method for embedding a composite, fiber-reinforced, resin-matrix structural element into a composite structural member in a pultrusion process, comprising:

providing a plurality of core elements, at least one of the core elements comprising a homogeneous material having reinforcing stitching through a thickness of the at least one core element;

aligning the plurality of core elements in a process direction;

feeding upper and lower fiber face skins onto outwardly facing surfaces of the aligned plurality of core elements to form a sandwich arrangement; and

pulling the sandwich arrangement through a pultrusion process comprising:

wetting out the upper and lower fiber face skins and the reinforcing stitching with resin, and

introducing the sandwich arrangement into a heated pultrusion die to cure the resin.

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20. The method of claim 19, wherein in the providing step, the reinforcing stitching extends diagonally through the thickness of the at least core element.

21. The method of claim 19, wherein in the providing step, the reinforcing stitching extends perpendicularly through the thickness of the at least core element.

22. A method for embedding a composite, fiber-reinforced, resin-matrix structural element into a composite structural member in a pultrusion process, comprising:

arranging a plurality of pultruded rods into a bundle;

feeding a plurality of layers of a fiber reinforcing material over the pultruded rods;

forming the layers into a form of the composite structural member, the form having a least one bend in a portion of the layers, with the bundle of pultruded rods embedded within the layers at the bend; and

pulling the structural member through a pultrusion process comprising:

wetting out the plurality of layers with resin, and

introducing the structural member into a heated pultrusion die to cure the resin.

23. A composite structural member form by the method of claim 22.

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